

What is claimed:

1. A multi-point seat belt for increasing survival chance of a passenger of a transport system in an accident or during in-flight turbulence, comprising

5 a first and second shoulder belt portion, a lap belt portion and an extending belt portion (1.1 to 1.4) and a first and second belt end (ER) and (EL), where the extending belt portion (1.4), having the second belt end (EL), loosely guided by a shoulder-belt-portion deflector (5, 5b, 12) and equipped with a belt retractor (13), having a clamping device, is attached to a stiff third transport-system member, generally representing a floor of the transport system adjacent to a second seat-side or a seat-backrest frame at the second seat-side or a post section of a motor vehicle adjacent to the second seat-side ;

10 a main buckle assembly (9.1) having a master release button (84) and attached to a stiff first transport-system member, generally representing the floor of the transport system adjacent to a first seat-side or a seat-cushion frame at the first seat-side or a mid-tunnel of a motor vehicle adjacent to the first seat-side;

15 at least two latch plates (2, 2a, 9, 11, 25), the first of which is a main latch plate (9), moveable along the lap- and second shoulder belt portion, and the second is a shoulder latch plate (2, 2a) of the first belt end (ER) of the first shoulder belt portion (1.1);

20 a lower belt deflector (17) which, attached to a stiff second transport-system member, which, generally representing the floor of the transport system adjacent to the second seat-side or the seat-cushion frame at the second seat-side or the post section of the motor vehicle adjacent to the second seat-side or a side rail of the motor vehicle adjacent to the second seat-side, deflects and loosely guides the lap belt portion (1.3) and the first shoulder belt portion (1.1); and

25 at least one upper buckle assembly (4, 4b, 4c, 4e, 14, 14a, 18, 18a, 18b, 18.1 to 18.3) located on the seat backrest at the first seat-side;

whereby

30 a lower body-part of a body (96) of the passenger and an upper body-part (95) are restrained by the lap- and second shoulder belt portion (1.2) when the main latch plate (9) is plug-in connected to the main buckle assembly (9.1); and

the upper body-part is restrained by the first and second shoulder belt portion, both (1.1, 1.2) extending crosswise in an X-shape when the shoulder latch plate (2, 2a) is plug-in connected to the upper buckle assembly.

35 2. The multi-point seat belt according to claim 1, wherein the master release button (84), when depressed, releases all the latch plates from the respective buckle assemblies.

3. The multi-point seat belt according to claim 2, wherein the master release button (84) is provided with release cables (4.2) connecting to release buttons of the upper buckle assemblies.

40 4. The multi-point seat belt according to claim 2, wherein the master release button (84) is provided with release wires connecting to electrical release-motors (4.2b) of release buttons of the upper buckle assemblies.

5. The multi-point seat belt according to claim 1, wherein the multi-point seat belt (1, 1a to 1d) consists of a three-point seat belt (1e) and an upper first shoulder belt (1.12a), a first belt end of which and a second belt end are provided with a transition buckle assembly (4e) and the shoulder latch plate (2a), which is plug-in connected to the upper buckle assembly; and
5 a transition latch plate (2) is attached to a first belt end of a lower first shoulder belt portion (1.11) of the three-point seat belt (1e);

whereby

10 the passenger is restrained when the main latch plate (9) and the transition latch plate (2) are plug-in connected to the main buckle assembly (9.1) and the transition buckle assembly (4e), where the lower first shoulder belt portion (1.11) projects through the lower belt deflector (17) at a sufficient length (l₁) needed for the belt retractor to retract the first shoulder belt portion, defined by the lower first shoulder belt portion and the upper first shoulder belt, in the accident.

15 6. The multi-point seat belt according to claim 1, wherein the multi-point seat belt (1, 1a to 1d) consists of a three-point seat belt (1e) and an upper first shoulder belt (1.12), a first belt end of which is provided with a transition buckle assembly (4e), which, having a transition release button (84c) and acting as the upper buckle assembly (4), in a home position is located on a seat-backrest aperture of the seat backrest at the first seat-side and
20 a second belt end is arranged to the seat-backrest frame at the first seat-side; and a transition latch plate (2) is attached to a first belt end of a lower first shoulder belt portion (1.11) of the three-point seat belt (1e);

whereby

25 in a coupling position the passenger is restrained when the main latch plate (9) and the transition latch plate (2) are plug-in connected to the main buckle assembly (9.1) and the transition buckle assembly (4e), pulled out from the seat-backrest aperture, wherethrough a transition portion of the upper first shoulder belt is projected, where the lower first shoulder belt portion (1.11) projects through the lower belt deflector (17) at a sufficient length (l₁) needed for the belt retractor to retract the first shoulder belt portion, defined by
30 the lower first shoulder belt portion and the transition portion, in the accident.

7. The multi-point seat belt according to claim 6, wherein the second belt end of the upper first shoulder belt (1.12) is provided with a second belt retractor (13a), which, arranged in the seat backrest (3.2) at the first seat-side, has a spring force, which is less than that of the belt retractor (13),

whereby

35 in the coupling position the belt retractor pulls the upper first shoulder belt out from the second belt retractor through the seat-backrest aperture or

40 in the home position the transition buckle assembly (4e), released by depressing the transition release button, is pulled by the second belt retractor until being located on the seat-backrest aperture.

8. The multi-point seat belt according to claim 7, wherein the transition buckle assembly is provided with an electrical release-motor (4.2b), which, when receiving an electrical signal from the main buckle assembly resulting from depressing the main release button releasing the main latch plate, pulls the transition release button to release the transition latch plate.

9. The multi-point seat belt according to claim 1, wherein the lower belt deflector (17) comprises a housing, having an attachment hole, and a pin (17.1), attached in the housing to form an aperture which loosely retains the released shoulder latch plate (2, 2a).

10. The multi-point seat belt according to claim 9, wherein the pin (17.1) is surrounded by a sleeve (17.2).

11. The multi-point seat belt according to claim 10, wherein the lower belt deflector (17) is made of one piece.

12. The multi-point seat belt according to claim 2, wherein the released shoulder latch plate is plug-in connected to an assisting buckle assembly (16, 16a, 16b), having an easily-accessible release button and attached to a seat, where the passenger, wanting to use the multi-point seat belt, easily accesses the shoulder latch plate, which is released by depressing the easily-accessible release button.

13. The multi-point seat belt according to claim 2, wherein the released shoulder latch plate is plug-in connected to an assisting buckle assembly (16, 16a, 16b), having an easily-accessible release button and attached to the post section, where the passenger, wanting to use the multi-point seat belt, easily accesses the shoulder latch plate, which is released by depressing the easily-accessible release button.

14. The multi-point seat belt according to claim 2, wherein a belt-feeding device (20a, 20b) consists of

a belt housing (20.4a) to which the shoulder latch plate (2, 2a) of the first shoulder belt portion (1.1) is attached; and

an operating arm (20.2a), to a first end of which and a second end are connected to the belt housing and a guide tube (20.1), pivotally attached in a supporting tube of the seat backrest;

whereby the shoulder latch plate (2, 2a) is inserted into and connected to the upper buckle assembly (4, 14, 18) and the first shoulder belt portion is moved from a resting position at the second seat-side to an operative position at the first seat-side by a rotatory movement of the operating arm.

15. The multi-point seat belt according to claim 14, wherein the belt-feeding device (20a, 20b) is provided with at least one drive apparatus to rotate the operating arm, where the shoulder latch plate (2, 2a) is inserted into and connected to the upper buckle assembly (4, 14, 18) and the first shoulder belt portion is moved from the resting position at the second seat-side to the operative position at the first seat-side by a rotatory movement of the operating arm when the drive apparatus is activated.

16. The multi-point seat belt according to claim 15, wherein the operating arm (20.2a) consists of

a horizontal portion, to an end of which the guide tube is fastened; and

a vertical portion, an end of which is fastened to the belt housing, having a vertical tube with two openings, facing each other, which is moveable along the vertical portion to adjust a height of the belt housing.

17. The multi-point seat belt according to claim 16, wherein a radial-adjustable tube (20.3) is attached between the horizontal portion and the guide tube, where the first shoulder belt portion is moved from the resting position to the operative position by a radial-adjusting movement of the radial-adjustable tube when the drive apparatus is activated.

18. The multi-point seat belt according to claim 15, wherein the drive apparatus is operable to return the first shoulder belt portion (1.1) from the operative position to the resting position, when a dwell time, predetermined for an engagement of the key with the receptacle, is exceeded.

5 19. The multi-point seat belt according to claim 15, wherein the drive apparatus returns the first shoulder belt portion (1.1) from the operative position to the resting position, when a dwell time, predetermined for inserting the shoulder latch plate (2, 2a) into the upper buckle assembly (4, 4a to 4c, 14, 14a, 18), is exceeded.

10 20. The multi-point seat belt according to claim 15, wherein the drive apparatus, activated in response to activating a switch, attached in the main buckle assembly (9.1), upon contact with a cam of the main latch plate (9), when inserted therein, is switched off when the operative position is reached.

15 21. The multi-point seat belt according to claim 15, wherein the drive apparatus, activated in response to starting an engine of the transport system, is switched off when the operative position is reached.

22. The multi-point seat belt according to claim 15, wherein the drive apparatus, activated in response to closing a vehicle door of the transport system, is switched off when the operative position is reached.

20 23. The multi-point seat belt according to claim 15, wherein the drive apparatus, activated in response to actuating a switch, is switched off when the operative position is reached.

24. The multi-point seat belt according to claim 15, wherein the drive apparatus is activated when the passenger takes a seat, where to a sensor is built, where the drive apparatus is switched off when the operative position is reached.

25 25. The multi-point seat belt according to claim 15, wherein the drive apparatus, activated in response to depressing x-times the master release button (84), is switched off when the operative position is reached.

26. The multi-point seat belt according to claim 15, wherein the master release button (84) is provided with

30 release wires connecting to electrical release-motors (4.2b) of release buttons of the upper buckle assemblies and

a release wire connecting to the drive apparatus
where the master release button, when depressed, releases all the latch plates from the respective buckle assemblies and returns the belt-feeding device to the resting position.

35 27. The multi-point seat belt according to claim 1, wherein the supplemental latch plate is a belt-detachable latch plate (25), which has a quick-release pin (25.1) and a U-shaped portion to house the belt portion of the seat belt which is secured therein by the quick-release pin and detached therefrom by pulling it.

28. The multi-point seat belt according to claim 27, wherein the seat backrest at the second seat-side is provided with supplemental upper buckle assemblies (19, 19a, 19b, 19.1 to 19.3), which together with the corresponding supplemental upper buckle assemblies at the first seat-side define the pairs of supplemental upper buckle assemblies (18 / 19, 18a / 19a, 18b / 19b, 18.1 / 19.1 to 18.3 / 19.3),

one of which is adapted to a small body proportion of the passenger, lower than the upper buckle assembly, and, finally, the belt-detachable latch plates, housing both shoulder belt portions, are plug-in connected to that pair.

29. The multi-point seat belt according to claim 28, wherein the belt-detachable latch plates, when not being used, are stored and secured in a storage box (25.5) of the seat.

30. The multi-point seat belt according to claim 28, wherein the buckle assembly is provided with a coupling fitting (1.2a, 1.2b) to receive energy absorbers.

31. The multi-point seat belt according to claim 15, wherein a belt-catching member (20.7, 20.7a) is attached to the seat backrest to intercept and hold at least one shoulder belt portion when being in the resting position.

32. The multi-point seat belt according to claim 2, further comprising a height- and width-adjusting mechanism (27) consisting of

a pair of tubes (27.1) of a seat backrest frame (3.4d) having a plurality of vertical locking slots, one pair of which is engaged with a locking handle (27.5), that can be pulled to detach therefrom and released to engage, when a height of a body proportion of the passenger is adjusted;

a frame (29) consisting of a pair of outer frame-tubes (27.2), moveable along the inner frame-tubes (27.1), a connecting member of all frame-tubes (27.2, 27.3) and a pair of outer tubes (27.3), in which inner tubes (27.4) are moveable, biased by tube-springs (27.6) and form- and force-locking connected to the locking handle (27.5), where the tube-spring (27.6) on a sleeve (27.7), secured by a pin (27.8), protruding through holes of the inner tube (27.4), presses against a spring rest (27.9 of the outer tube (27.3);

a plurality of horizontal locking slots arranged along one of the outer tubes (27.3); and at least one buckle-assembly unit (18.3, 19.3), consisting of an upper buckle assembly (4c), to connect to the shoulder latch plate, and a housing (18.12), form-locking connected to the upper buckle assembly, moveable along the outer tubes (27.3) and secured by a pawl (18.10) biased by a pawl-spring (18.5), engaged with the horizontal locking slot (r) and detached therefrom by pulling the pawl to adjust to a width of the body proportion.